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WHOLE No. 3289

NEW YORK, SATURDAY, MARCH 19, 1921

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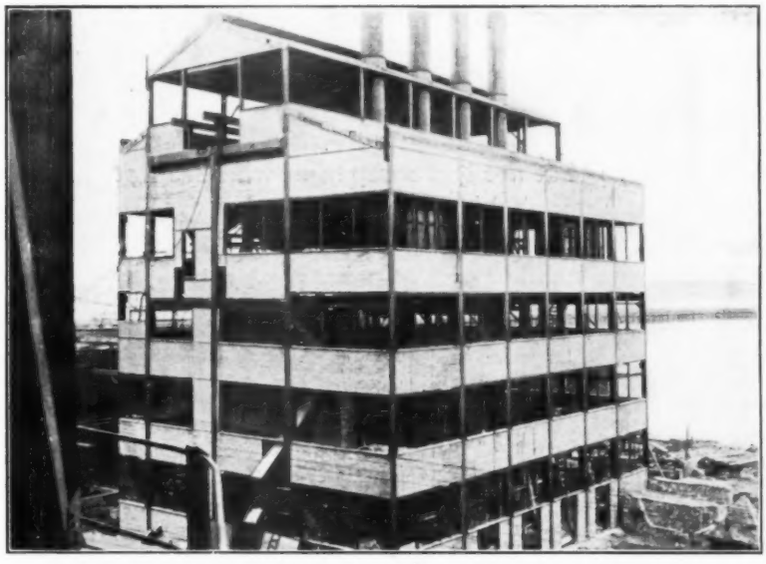

Glover-West Vertical Retort Plant, Portland, Me.

The West Gas Improvement Co., Inc.

NEW YORK

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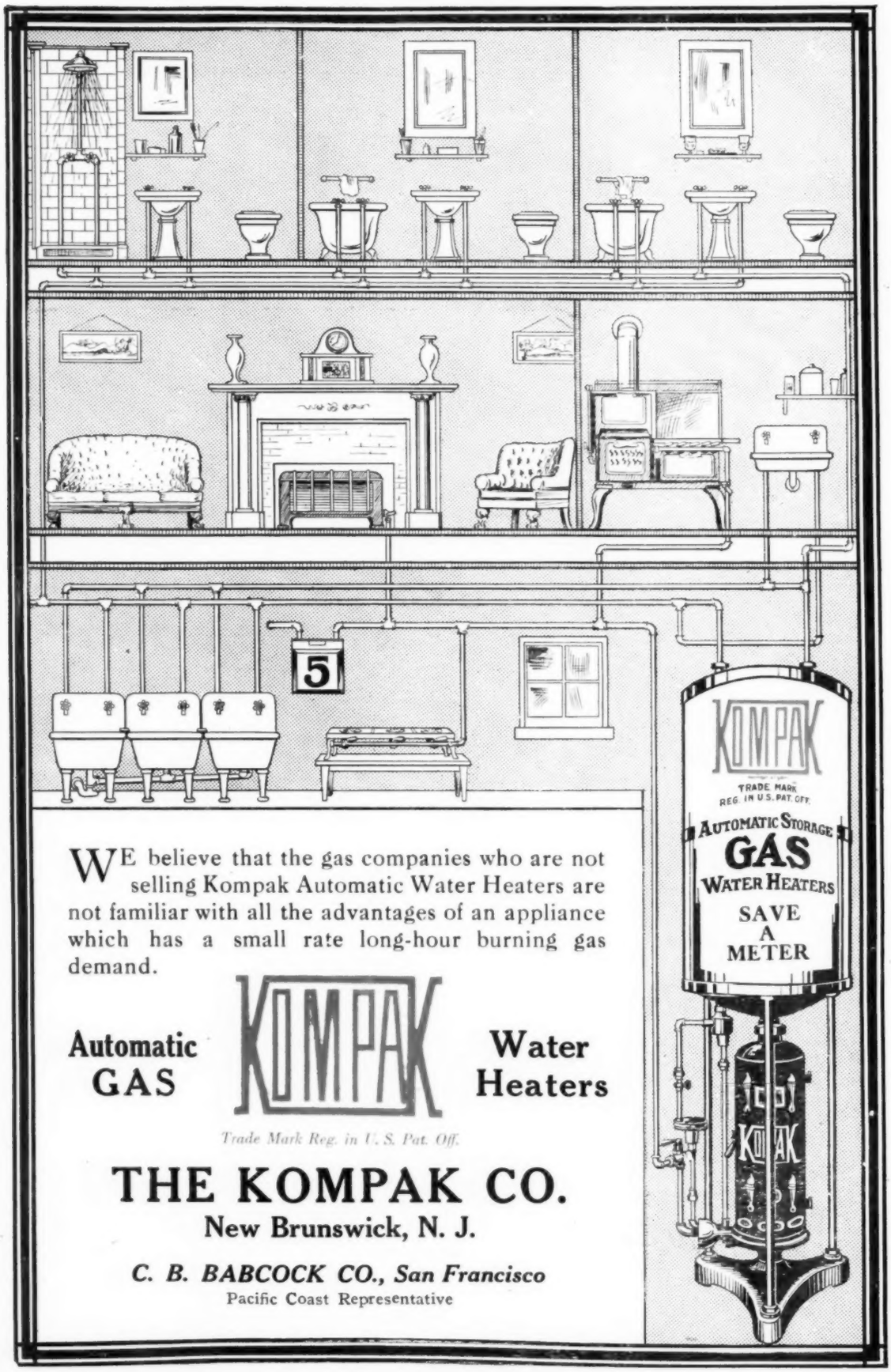

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American Gas Journal

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Denver's Gas-Pressure System

Describing a System that Can Be Used Anywhere

By GEORGE WEHRLE

Superintendent, Gas Department, Denver Gas & Electric Company

The pressure system used in Denver is not a new scheme but is the application of a modification of the original method of distributing gas at low pressure from central plants. In this original scheme it was desirable to have the gas plant near to the load center of the distribution system. If the load center moved with the growth of the city or if new load areas developed, either higher initial pressures at the plant or larger mains were required; ordinarily this increased capacity was required only for a brief period of the day. It is evident that in a large or rapidly growing city a low pressure system, or the use of existing low pressure mains for the distribution of gas at high pressures from one central plant, is neither economical in installation nor efficient in operation. To avoid both of these conditions high pressure systems have been quite generally used. In our case we literally supply a gas plant to the new load area, when the need for such becomes apparent, by installing a district holder which receives its supply of gas from the works through existing mains at the time of least demand and discharges into the center of its load area when gas is needed.

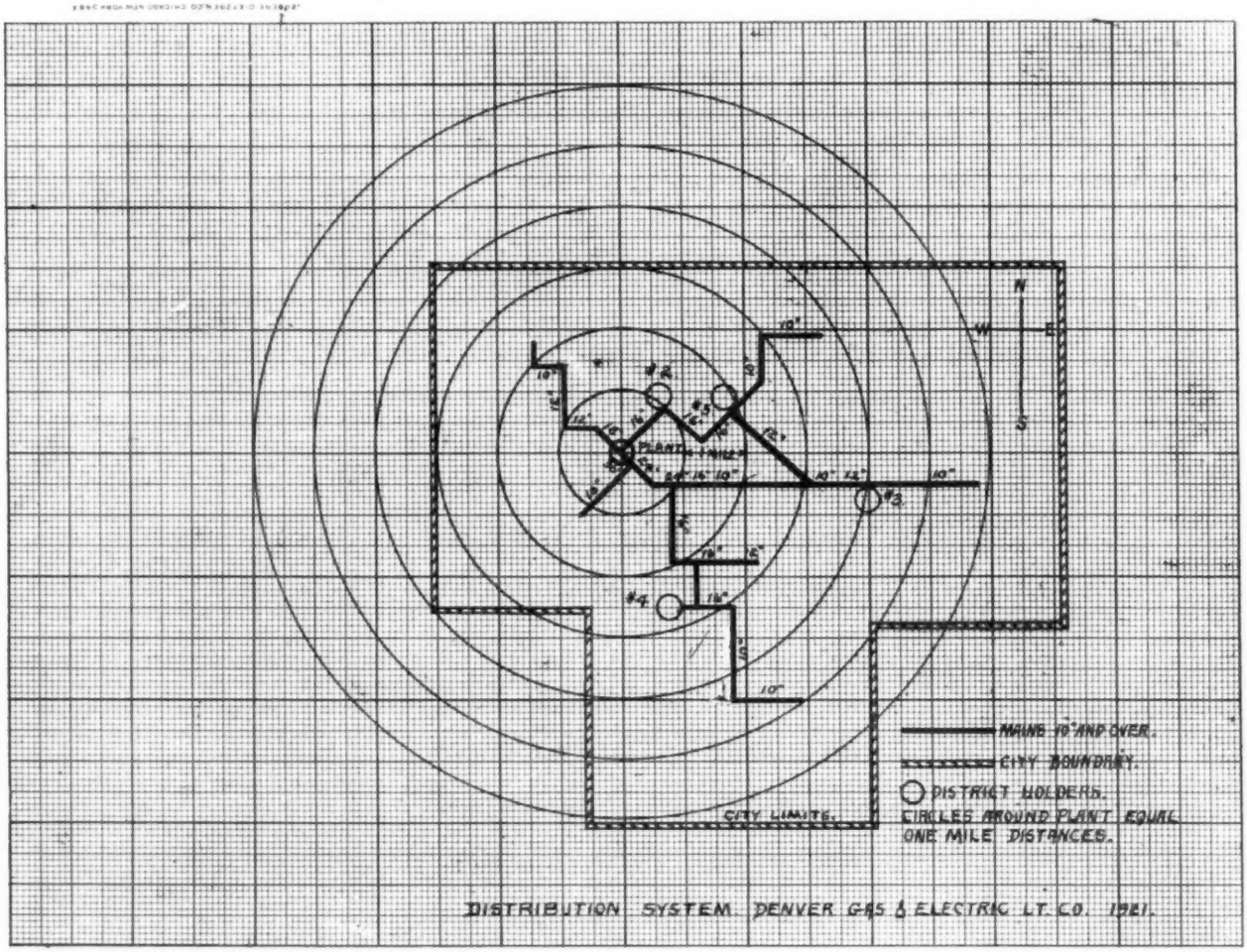
Mr. Wehrle tells of a distribution system whereby the nearest approach to an ideal pressure condition is attained at a minimum cost of plant investment. This system can be used by any company and and is well worth studying.
—Editor.

If ideal distribution of gas could be attained there would be a minature gas holder in every customer's premises which would be of such size as to supply his need for gas during the demand periods and in which the supply would be replenished when his demand ceased. The load factor on mains and services would be 100 per cent, since an equal rate of flow into the numerous holders would be going on at all times. The size of mains and services would be very small, since they would not need to be proportioned to meet any peak demands. As an idea of how small a service pipe might be required to supply an ordinary domestic customer with his average monthly requirement of 3,000 cu. ft. divide this amount by the number of hours in a month and it is found that 4 cu. ft. per hour is the rate of flow, which could be supplied through a service pipe as small as one-quarter inch in diameter. We cannot hope to attain these ideal conditions on a practical scale using so many small units, but we can attain similar conditions by the adoption of larger units—namely, district holders. Every time a district holder is installed we improve the load factor on the existing distribution system by reducing the peak demand and increasing the off-peak demand upon the central plant. If the holders are properly distributed it is possible to obtain a perfect plant load factor through the constant flow of gas in the mains leaving the plant to the holders and customers. Since the need for storage holders at the plant varies inversely as the load factor upon the mains leaving the plant, the proper installation of district holders removes the necessity for anything but a relief holder at the plant, of sufficient size to compensate for variable manufacturing operations occurring throughout the day. This holder may be found to be surprisingly small as compared with the commonly accepted sizes of plant holders in general use. It is not beyond possibility to dispense with the works holder altogether when the district holders are in sufficient number and properly located in relation to load demands.

Evolution of Low Pressure System

We will follow the evolution of an ordinary low pressure distribution system into the system now used in Denver. It is presumed that in the beginning of gas service in the city the plant is located in the most advantageous geographical and physical position obtainable for best distribution of gas to all parts of the area to be served. The distributing mains will probably be designed to provide for a reasonable

period of growth and expansion of gas serving facilities and will take into consideration the logical direction that future expansion will pursue. When the growth of the city or increased uses for gas catch up with future provisions made for adequate distribution, pressures diminish in the extremities of the distribution system below the point of efficiency of utilization. Something must then be done to maintain proper service in the outskirts of the system, and two things present themselves as the easiest solution:



First, to increase the sizes of feeder mains beginning at the plant, or at the junction point supplying the affected area, or, second, to increase initial pressures at the plant sufficiently to offset the conductivity loss in the mains supplying the affected area. Some companies have followed the first policy at large expense thereby building a certain distance into the future and still maintaining the original low pressure system.

We have abandoned the first sheme and adopted the second as the most economical and the one providing greater flexibility of service. We must presume that when pressures in the outskirts of the distribution system became inadequate that the full pressure exerted from the plant by the weight of the holder, on the peak load, had been utilized and that the station governor, for such an apparatus would undoubtedly have been employed, had been wide open at such time of peak demand. The first step toward improvement of service would be the installation of boosting equipment at the plant. Pressures would then be carried throughout the daily period sufficient to maintain proper pressure at the lowest point in the distribution system. The plant pressure would be carried by a predetermined schedule worked out from recording pressure charts taken at the low point in the system and this schedule would be changed as frequently as necessary to provide adequate service. Naturally, as the demand upon the gas system grows the pressure at the plant must be increased until a point is reached where the pressure required at the plant, and in the mains adjacent thereto, will become practically prohibitive due to the original construction of the distribution system having been designed for low pressure service and therefore subject to excessive leakage at the pressure now applied. Another step in the evolutionary method must then be taken.

Using a District Holder

Three ways are open: First, by the enlargement of mains, thereby reducing pressures to a normal range again before proceeding as before; second, by installing separate high pressure mains feeding into the low pressure system at proper points through district governors, or, third, moving the plant to an-

(*Continued on page* 254.)

The British Gas Industry

Its Difficulties and Recent Experiences

By T. SINGTON

In Great Britain the gas works on which the community relies for lighting and heating are mainly in the hands of the public authorities, but in some towns they belong to private companies and generally earn only a meager return on the capital invested, as they are in many cases subject to the provisions of acts of Parliament. Some of these companies have recently published reports from which interesting information may be gleaned of the difficulties with which they have had to contend during recent years and the gloomy future which they have to face, largely due to coal and labor difficulties, but also, in common with other industries, to official control and interference by hordes of officials with no practical experience of the industry.

Much of the information contained in this article is new, for while it is generally known that British gas enterprises have been experiencing difficulties it has not been known just what these experiences were.

Here is an authentic account of the present situation.—Editor.

Shareholders have been told that the future as regards to raw material, coal and by-products, is very uncertain. Some companies have to devote 75 per cent of any surplus profit towards the reduction of the price of gas and the other 25 per cent equally to the employees and the shareholders. The coal supply has never been of worse quality than during the period of its production and distribution has been under Government control; it furnished one more example of the inevitable result with which so many millions have now become acquainted with during and since the war; namely, that the more completely an industry is in Government hands the less efficient does it become. The price of gas to consumers has, of course, risen, mainly since peace was restored; in the district where this is being written the price of gas was 64 cents per 1,000 ft. during the war. During 1918 it rose to 84 cents per 1,000 and last year the price became 96 cents. Another increase may shortly be expected.

The increased outlay of gas companies on account of higher wages and greater cost of coal, would have resulted in heavy loss, if there had not been a large profit from the sale of residuals, which in the case of one company amounted to no less than $9,600,000 more during 1920 than for 1919. All items under the heading of residuals have shown better returns than during the preceding years, the main one being coke.

It is notable that in spite of the competition of the electric light the consumption of gas is steadily increasing and the number of new customers may be counted by thousands. There is every prospect therefore, of a continued large increase of business in the future—only blurred by coal prices and labor trouble possibilities.

Quite recently gas companies have unexpectedly experienced a slump in residuals, which has been so serious as to add $1.30 to the price of gas, which depends to a large extent on the revenue obtained from residuals. The high price recently obtained for coke from continental buyers were temporary and could not be maintained, but no one could foresee that the fall would be so rapid and great. During the autumn continental buyers readily paid $52.80 per ton and early this year they offered $19.20 per ton. The reason for this sudden break in price was chiefly the coal strike. Every one on the continent has been talking about it for many months and had been making preparations to meet it during the summer and autumn, buying coke and coal at very high prices. Coal was imported from the United States and South Africa, and even from Australia and China on the assumption that the strike probably would be protracted. Continental buyers were taking no risks and were determined to be prepared for a stoppage of British supplies for a considerable period. Instead, however, of the strike lasting as was expected for two months or so, it was all over within less than three weeks. It was then found that the continent was glutted with both coke and coal and not in a position to absorb any further quantities. Moreover, consumption has been limited as the winter in Northern Europe has been exceptionally mild and, further, almost all continental countries are experiencing great trade depression. A gradual fall in prices had been anticipated, but no one dreamt there would be a landslide.

By the middle of January the slump had also extended to tar products and sulphate of ammonia, which is now selling at $116 per ton in England. Arising out of the war the quality of the gas provided for English consumers has been of inferior quality. The pre-war standard averaged 500 B.t.u. and over per cubic foot. Eventually, however, the exigencies of the coal made it necessary to reduce the calorific

value of the gas in order that certain constituents necessary for the manufacture of high explosives might be obtained in increased quantities. The Government afterwards issued an order by which gas undertakings generally, who washed their gas for the production of benzol, were given a standard calorific value of 450 B.t.u.

The question may be asked why many British gas works do not return now to pre-war conditions, as the national necessity no longer exists for reducing the calorific value below 500 B.t.u. The reason is that were the calorific value raised to the pre-war figure by enriching with oil at the high prices now ruling, a higher price would have to be charged for gas. Therefore by continuing to supply gas at a slightly lower calorific power, say about 485 B.t.u., the price of gas to consumers is kept down and by providing a mixture of coal and water gas, the consumption of coal is reduced. The policy in regard to the quality of gas is the same with both municipal and private gas works.

A new system of providing and charging for gas by quantity is being introduced. It will in many instances be sold by the "therm" instead of by the number of cubic feet and it is proposed to declare a calorific value of 475 B.t.u. The new standard price charged by many English gas works is 28 to 32 cents per therm, which is practically the equivalent price for $1.32 for a thousand cubic feet—a price which will only allow a return of a modest 5 per cent on the capital invested.

As regards gas works in England their position relative to coal cannot be foreseen at present. There can be no doubt that it is a good thing for the gas industry that coal is to be decontrolled from March 1. Control by ignorant officials has done endless harm. Private enterprise could have grappled with all difficulties of recent years, as all those engaged in it have had lifelong experience and training. Now every one is saying "good riddance" to the official hordes and their clumsy methods. The gas industry is exceedingly interested in everything relating to coal as it is one of the largest consumers. British gas works have been compelled to pay monstrously high prices for oil, which is used in considerable quantities—not less than six times the pre-war price. It is most desirable from the gas consumers' point of view that a certain percentage of the gas made should be produced by the carbureted water gas process. A reduction in the price of oil would therefore be an advantage.

Labor Cost Advancing

The cost of labor in the British gas industry is going up by leaps and bounds. The wages bill has recently risen to an amount equal to 12 cents per thousand cubic feet, a very serious matter.

The New Unit for Gas in Place of Cubic Feet

British gas works managers have introduced a new heat unit called the "Therm," mentioned above, of which the following details may be given: It is to be equal to 100,000 B.t.u. A cubic foot of town's gas in Great Britain would furnish before the war from 550 to 650 units. The advance of science and research and more especially the absolute necessity for economy whenever and wherever it can be obtained has forced us to study such important details. Thus we want to know not only that one pound, say, of anthracite coal should furnish us with 14,500 B.t.u. and the burning of a gallon of fuel oil so many more units, but we want to know the actual cost of the heat units and out of that the new unit, the therm, has arisen. With electricity the charge is based on the kelvin, which equals 1,000 watt hours. For lighting and a good many other purposes the cost of gas generally is less than that of electricity. Experts suggest it sounds much better to charge a few cents per therm for gas, precisely as electricity is charged at the rate of a few cents per kelvin. The old system of charging gas by a price per 1,000 cu. ft. is therefore doomed.

It is estimated that a ton of coal, if properly burnt to ash and carbonic acid, would furnish 30,000,000 B.t.u. or 300 therms. In practice the ton of coal produces very much less than the useful therm, which are converted into mechanical energy from a very small fraction of the 300.

Service Charge Fair and Just

New Haven, Conn.—A new flat rate for gas instead of the meter or service charges would cause big consumers to use other fuels, and would ultimately result in bigger gas rates to the small consumer, Charles H. Nettleton, president of the New Haven Gas Light Company, told the legislative committee on the Judiciary, in opposing the proposed legislation which would prohibit gas and electric light companies from making the meter and service charges.

Mr. Nettleton, George D. Watrous, Charles E. Chase, chairman of the board of directors of the Hartford Fire Insurance Company, Lucius F. Robinson, Harrison B. Freeman and others strenuously denied that meter and service charges were unfair and urged the judiciary committee not to rob the Public Utilities Commission of the power to determine the reasonability of these charges. Mr. Watrous, chief counsel for the New Haven Gas Company, and other set forth the following as the vital considerations in the bills before the Legislature:

1. That the bills should be rejected and the matter of rate regulation should be left to the Public Utilities Commission, which he characterized as a "fair body of men."

2. That the service or meter charge is just and equitable.

3. That the proposed legislation would destroy the rate structures built up by electric light companies as these companies based their rates on a service charge basis.

4. That the small consumer for whom the protest is made in most cases used gas for emergency purposes only.

Lucius F. Robinson, counsel for the Hartford City Gas Light Company, told the committee that the proposed legislation would tie the hands of the Public Utilities Commission in determining what was the proper basis in making charges for gas. He did not believe that the Legislature should attempt anything like that. Mr. Wall, of the committee, asked if the Legislature or the Utilities Commission should settle a question of public policy.

Must Keep Truth to Fore

W. M. Willett Addresses Illinois Gas Association

Public utilities are public necessities. They supplement the sunshine and the air. They provide our light, our fuel and our means of communication by way of transmission of intelligence and transportation of person and of property. In the troubled period of the last five or six years we have undergone great economic changes. Fortunes have been made. We have viewed with awe and wonderment the accumulation of great wealth by many of our people. During the war times a new word was coined, "profiteer." During those times our industries and business in general and our wage earners were all busily engaged in accumulating wealth. I should not say all, because the public utility during those times was busily engaged in trying to maintain its existence. With increases in wages and costs of material and commodities, the utility had to make a most determined fight for its life. Many of them failed and were forced to go to the "happy hunting ground" of utilities receivership. But, nevertheless, every one carried on and none were classed as "profiteers." There was no let up in the furnishing of light, heat and communication. Food was cooked and light was furnished by their gas and electricity and the worker went to the mill on their street cars. But what of the present? At the first breath of changed economic conditions, at the first intimation that prices of commodities would drop, we stood by and saw retrenchment on the part of our manufacturers. We witnessed the closing of mills and of workshops and general reduction of expense. No one should be blamed for this. That is entirely proper. But what of the utility? Were there any closing of the doors and throwing of men out of employment? Was there any failure to meet the demand for light, heat, power and communication? Prices to utilities, both of wages and materials, are still high and many are still headed toward the "happy hunting ground," but yet they carry on, and food is still cooked and light still furnished, even though not so many workers go to the mills on their street cars.

This address of President W. Willett of the Illinois Gas Association contains a lot of good common sense. While Mr. Willett speaks optimistically he faces the future with a full recognition of its problems.—Editor.

Suspicion of Public a Handicap

One of the greatest handicaps in the development of the utility industry, at least in recent years, has been the general suspicion aroused through misconception and lack of information on the part of the public, and through ignorance, and through agitation by the self-seeking small caliber politician. When they have the truth the people are fair, and we owe it as a duty of good citizenship to see that they are not misled and to go over the heads of these demagogues, straight to the people with our problems. We have in our keeping the savings wrought by hard work and self-denial of approximately 400,000 men and women, representing with their families about one-fifth the population of this State, totaling the vast sum of one and one-quarter billions of dollars. We are responsible to about 200,000 employees and their families, representing nearly a million souls. We must accept this responsibility, and in this time of stress and readjustment with the world's manner of thinking turned topsy-turvy, with the non-thinking ready to accept radicalism such as has destroyed nations, we must see that the truth is always kept in the fore. In such periods, short-lived as they usually are, we find the agitator and the shouting type of politician springing up to advocate the confiscation of utility property or utility value. The fact should not be overlooked that when he is discussing this he is not only discussing the confiscation of utility property but the confiscation of all property, whether store or farm, or the worker's home, for the same theory must apply to all. These theorists and radicals cannot attain permanent success in this country that offers to all from the most lowly equal opportunity to advance his position and become an owner of part of the great wealth which is constantly developing in a nation of such unbounded resources, but if we allow it, by beclouding the issue, they may make a great deal of trouble.

About two years ago the Illinois Committee on Public Utility Information was created through the action of our association. That organization was founded on the belief that so intimate had become the service we render to every living moment of individuals, and so wrapped up was the prosperity of the State in the prosperity and ability of the utility to develop, that their good and welfare were inseparably bound together; that neither the utilities nor the public could gain advantage in any situation without this being reflected in the welfare and happiness of the people.

This committee has carried our message straight to the people, being 100 per cent honest with them and many are the evidences of the good accomplished. This movement inaugurated by progressive Illinois has grown until now similar bodies are existent in a dozen other States and it bids fair of adoption in every State in the Union.

At the present time the housing problem is one of the most serious facing the State and it vitally concerns the utility industry. On every side in the urban and rural communities alike we hear of the distress of our people who are unable to obtain housing facilities. We find them beset by greatly increased rents, due in part to the increased taxation, but without a doubt largely to the great shortage of dwellings which has led to exceedingly high rentals. It is a situation which affects every householder's pocket-book, discomforts him and causes him agitation which has a decided effect upon the entire program of readjustment, and necessitates immediate rectification.

There can be no new dwelling, there can be no growth to our cities and towns unless the utilities are prosperous and able to grow as the demands from our people come to us. Unless we are able to furnish gas, electricity, telephones and transportation this housing program cannot go forward and the suffering and inconvenience of our people cannot be relieved.

$500,000,000 Needed in Illinois

How are we to extend our gas mains and add to our plants? How are we to extend our electric lines and equipment, and our communication and transportation facilities to serve the new buildings as fast as they are contemplated or extended to new subdivisions yet undeveloped? It has been conservatively estimated that not less than $500,000,000 of new capital must be obtained from the thrifty through the exchange of our securities for their savings within the next three years, if we are to keep pace with the necessary growth in housing facilities. We must obtain this money and invest it in the public's good. We must obtain it in competition with all other industry, unrestricted as to earnings and sale price. We must maintain a credit such as will make our securities appeal to the cautious and conservative investors. We must be able to assure him that his savings will be safeguarded and that he will receive a fair interest return in exchange for his money's use. We must keep our properties on such prosperous footing as will enable us to keep pace at all times with the State's growth, and with the demands of its people, and, on such basis as will attract business and industry to the State

We should not minimize the difficulties of the present situation. We are paying high freight rates on our coal and coke, our oil, our steel, and our great quantities of materials that enter into production and maintenance. The interest charges we pay for use of the great sums of money we must borrow are fixed by the price we must pay in competition with other industries that are unregulated as to earnings. We are forced to contract for our coal, coke, oil, and supplies over long periods, for our service must be continuous and we cannot rely upon daily market supplies of these products, nor take advantage of momentary declines in market prices. It does not seem humanly possible that greater economies can be practised by the industry than has been the case during the war and post-war period without great injury to the service upon which the public is so dependent. But somehow, inadequate as our revenues from rates are, due to the burdens imposed upon us in the shape of operating expenses and cost of money over which we have no control, we must find a way to keep the industry not only alive and functioning, but progressing and growing so that the people's interest may be served.

I suggest your whole-hearted co-operation with your commercial clubs, your civic organizations, your city authorities and every group of citizens who should be actively interested in solving our problems. It will be only through the fullest co-operation that this situation which means so much to the prosperity and happiness of our people, our communities, and ourselves will be met.

Coal vs. Water Gas—Carbon Monoxide Causes Poisonous Action

By Mark Meredith

The poisonous action of lighting gas is said to be entirely due to the carbon monoxide contained in it. With pure coal gas in use the risk of poisoning is almost negligible, but with carbureted water gas (containing about four times as much carbon monoxide as coal gas) the risk of accidental poisoning is about sixty times as great. There are numerous cases of suicide and murder with carbureted water gas. Experiments have shown that, however long the gas was left turned on, it was almost impossible to produce a poisonous percentage of carbon monoxide at the sleeping level where pure coal gas was used, but with carbureted water gas it was quite easy.

The introduction of the mantle and of improved flat-flame burners has very considerably reduced the risk of carbon monoxide poisoning in bedrooms. It is suggested that a definite maximum for the percentage of carbon monoxide should be permissible in domestic gas and 20 per cent is suggested as reasonable.

Sheridan, Wyo., Gas Plant Given Increased Rates

By J. D. Dillon

Mention has previously been made of the fight between the gas company and the citizens of Sheridan, Wyo. The company insisted that either more money must be paid them, or they would be forced to close up, and the citizens answered "nay." Therefore the matter was taken before the Public Utilities Commission at Cheyenne.

Both sides were well represented at the hearing, hence it is that the finding of the commission should be received as justifiable.

A former manager of the plant testified that the company were entitled to the $3 rate asked, but the city of Sheridan and the commissioners at Cheyenne have granted the Sheridan Gas & Fuel Company an advance in rates to $2.75 per thousand maximum for gas, scaling down slightly for larger users, with an additional 50 cents service charge.

While it is contended by the company that the new rates will not fully cover operating and depreciation costs, nor bring in any return on approximately $300,000 invested, either in the way of interest or the actual interest being paid banks on borrowed money, still it gives the company some hope and they have decided to try it out.

Accident Prevention in Gas Industry*

Safety Work Needs Executive Backing

By FRED M. SMITH

Some six years ago I was employed by a large utility corporation in the capacity of claim agent. This company, besides supplying electrical energy to about seventy communities and operating two city street car systems and an interurban line, manufactures and distributes gas to nine of the principal cities in this territory.

While serving as claim agent for this company I helped to perfect, under the direction of the Bureau of Safety, an organization for the prevention of accidents and thus came into direct contact with all of the accidents occurring in the company. Its accident record was similar to that of most other companies operating combined utilities inasmuch as the accidents growing out of the operation of the electrical and traction properties far exceeded in number and seriousness those that occurred in the manufacture and distribution of gas, and also like many companies of this character where similar records occur, the gas properties were at first sadly neglected by the safety organization. Efforts were centralized in the electric and traction branches of the work and the employees in the gas plants and distribution departments were given very little attention. We were brought to realize this neglected duty by a very serious explosion in one of the gas plants. Considerable property damage resulted and two men were badly injured. An investigation showed that the principal causes leading up to the explosion were a combination of physical defects in the equipment and failure on the part of the plant foreman to enforce established plant rules. These causes would not have existed if closer attention had been given to safety and fire inspections and assurance of due regard for the rules by the employees through the influence of safety teachings. A disaster is sometimes necessary to impress employers with the importance of and necessity for definite and systematic safety work. This is particularly true on those properties where accidents infrequently occur.

This introduction to my subject illustrates one company's experience in belittling and neglecting one very important branch of accident prevention work, that of the gas utility. An experience that many other gas companies have had and will continue to have until they are brought to a realization of their mistake through some disaster resulting in either loss of life or damage to property, or both. It is true that the gas industry as a whole does not give to safety work the proper earnest attention nor employ the systematic methods that other branches of utilities do. My observations have led me to believe that the reason for this is twofold:

First. Very serious accidents wherein loss of life and large property damage occur, are few as compared to other industries. The bulk of accidents that do occur are not spectacular and therefore the need of organized effort toward accident prevention is lost sight of by the owners or executives. An analysis of the accidents in one company can be cited as an example to show that accidents in this industry are more serious than generally considered. Out of 550 accidents 40 per cent resulted in lost time with an average of six days lost time per accident. This condition is not realized by the average executive. If such companies would carefully compile their accident records, analyze them and obtain figures showing their costs, lost time and the resultant loss of efficiency in operation and compare the knowledge thus obtained with the experiences of those companies which have organized accident prevention, they would readily see their own shortcomings.

Executives Indifferent to Safety Work

Second. Another reason for this inactivity is that skeptical, indifferent attitude that some executives have toward safety, a state of mind which, I am happy to say, is being gradually overcome by the steady advancement of safety work and the piling up of convincing arguments in its favor. Success in accident prevention can be assured only by starting with the head of the organization. He must give it his earnest support and must consider it of equal importance to the other departments in his company. He must believe in it and must realize that safety work is not a one-man job and that his attitude with respect to it must be manifested in such a way that his department heads, superintendents and foremen will be influenced by his example. The degree of interest in the work by his immediate subordinates will be governed by his own interest and their enthusiasm will be reflected in the attitude of the employees under them The efficiency of the employee is generally in direct ratio to the policies of the individual who directs him, and so it is in safety work. If the man higher up is a safety man so is his subordinate Successful safety work can therefore be summed up in two words, "executive backing," without which no line of endeavor can hope to obtain successful results.

We find that it is an easy matter to get the momentary interest and attention of the employee through safety meetings, bulletins and other means of approach, but in many cases this lasts only as long as he is being talked to. He is quite likely to return to his work and pursue the old and unsafe methods unless properly supervised To get necessary, continuous enthusiasm and hearty cooperation from him is well nigh impossible without the influence and support of a supervisor, who is in sympathy with and firmly believes in safety work. Working along these lines many of those companies having safety organizations are giving particular attention to the problem of the foreman, a class of employee that is difficult to reach, for by the nature of his work his energies are directed toward practical features of production, operation and service. His support is generally obtained by direct contact at meetings made up solely of foremen and supervisors, and in special cases by personal appeal in an endeavor to show him the responsiblity that is his not only for the quality of work turned out by the men under him, but for their safety by seeing that no unsafe methods or habitual infraction of rules creep into his

(*Continued on page 256.*)

*Paper read at annual meeting of Illinois Gas Association.

Rapid Determination of Water in Tar Emulsions

Paper Read at Illinois Gas Association Meeting

By W. W. O'DELL, Bureau of Standards, and E. W. THIELE, Peoples Gas Light & Coke Co.

As a part of the gas research program conducted under a co-operative agreement between the engineering department of the University of Illinois, the Illinois Geological Survey and the U. S. Bureau of Mines, a study has been made of the factors causing or affecting the formation of the tar-water emulsions in the process of manufacturing water gas. This investigation was made after the research committee of the Illinois Gas Association suggested that the problem was one requiring further study.

In conducting this investigation the Peoples Gas Light & Coke Company co-operated by furnishing the use of one of their laboratories in Chicago, by assigning E. W. Thiele to take an active part in the work, and by other expressions of interest in the experiments conducted.

In the course of this study it became desirable to have a short and simple method for determining the water content of tar emulsions. This paper presents two such methods which were employed by the writers and which may be of interest to others.

Nature of Tar Emulsion

Tar emulsion is essentially tar in which droplets of water of various sizes are suspended. Strictly speaking, there may be almost any amount of water in the suspension. It would be unusual, however, to speak of a tar with 10 per cent water as an emulsion. On the other hand, the water content may be very large, sometimes as high as 85 per cent of the whole. Such an emulsion, in spite of its being mostly water, will not mix with water, for each water drop is completely surrounded by tar. On the other hand, it may be readily diluted with more tar, or with any of the solvents for tar, since the tar in the emulsion forms a continuous network, to every part of which the solvent can penetrate.

Previous Work on This Determination

Aside from the various modifications of the distillation methods, there seem to be only two methods which have been used to determine water in tar. Brunkow evaporated a heavy oil-gas tar, containing no light oils, in a drying oven, while Kayser has described a calcium carbide method. It is evident that the former is of very limited application; the latter, though probably accurate, is difficult to carry out and requires elaborate apparatus.

The standard method of determining the water in tar is, of course, by distillation. In the method of the Barrett Company, as described by Weiss, 200 c.c. of the emulsion are mixed with 200 c.c. of light oils and distilled to 400 deg. Fahr., the water being collected and measured. An accuracy of 0.1 per cent is claimed for the method. Considering the various sources of error inherent in the method, such as the sticking of water to the sides of the condenser and the solubility of water in the oils, this would seem to be the extreme limit; if the mixture shows any considerable tendency to "spit" (froth and boil over) the limit will be much higher. A determination by this method also requires a considerable amount of time and attention on the part of the analyst, as well as a good deal of desk space.

There is, however, another method which, so far as we are aware, has not been used for tar but has been much used for the analogous petroleum emulsions. It is a common practice to determine water in these by adding to them a light gasoline. The mixture is then centrifuged, whereupon the water goes to the bottom and its volume can be read directly. This method is the same in principle as Method I, described below.

Method I—Centrifuging with a Heavy Solvent

This makes use of the fact that tar emulsions can be mixed with heavy solvents. The tar is completely dissolved in the solvent, so that the water droplets are suspended in a liquid which is not, like tar, of nearly the same specific gravity as water, but is much heavier and also much thinner than tar. Under these circumstances it is not difficult, upon centrifuging, to bring all of the water to the top, where its volume can be easily measured.

The apparatus for carrying out this method can be obtained ready-made, since ordinary milk and cream testing apparatus is very suitable for use in this way. In our work we used an ordinary hand centrifuge made for milk testing, and built to accommodate eight bottles at one time. A speed of about 2,000 r.p.m. could be attained with this apparatus.

The form of bottle used holds about 50 c.c. and has a long, slender, graduated neck. The graduations are numbered, each unit representing 0.2 c.c.

The qualities most desired in a solvent for use in this method are that it should be a fluid of high specific gravity, a good solvent for tar and immiscible with water. Carbon tetrachloride and carbon bisulphide, of common liquids, best fulfill these conditions. We found the latter to be slightly the better of the two; but its ready inflammability and disagreeable odor led us to prefer the carbon tetrachloride.

With most tars, however, when they are mixed with the solvent and centrifuged for a reasonable time in a hand centrifuge, there is at first sight not a complete separation of tar and water. The upper portion of the neck of the bottle contains clear water, and the body contains solvent with tar dissolved in it. But between these is a material which is somewhat like the original emulsion, being dark and rather thick. It has no sharp upper boundary. It varies in amount with different tars, being generally most abundant with the most obstinate emulsions, in which it may occupy more room than the clear water.

On closer inspection, however, it is seen to be

(*Continued on page 257.*)

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As the Journal Views It

Publicity Campaigns

There is a tendency it seems on the part of many executives to drop the publicity campaigns that they started, or if the campaigns are not dropped entirely, then they are allowed to drag along, doing more harm than actual good. This condition should not be allowed to exist, for it means that the investment that has been made in this promotion work will be entirely lost.

The greatest asset that any company could possibly have at the present time is a widespread knowledge of the conditions that it is confronted by. And the only way to secure this asset is by means of publicity. Tell your public the story of your company. Make news. If you are doubtful of what news consists then secure a publicity man who knows his business. He will quickly produce for you and the results that can be obtained will be surprising.

But there is just a word of warning. The publicity that is sent out from your company must refer to your company and not to the industry at large. In other words your consumers are interested in conditions that exist in their own community but they are not vitally concerned with what is taking place in some other town except in a general way. There is a great deal of matter that is being furnished to gas companies that is an absolute waste of time furnished to gas companies that is not worth the space it would take. But there are many companies that believe that their story can be told in this way and that it will produce results. It certainly will not. Anything that is general or that is written to apply to hundreds of companies cannot by any possible stretch of the imagination be conceived to apply to a specific company. That is one way to waste money, even though the cost be small. It is much better to se-

cure a good publicity man and let him tell your story. If he knows what he is doing, and the results will quickly tell, then you are going to be well repaid for the larger cost.

But above all, the publicity campaigns which were started so vigorously a year ago should not be allowed to fall by the wayside.

Training Men

The plaint of the employee of a gas company who filled a minor position that when the executives and department heads are selected men are brought in from the outside seems to be well founded in the cases of numerous companies. This does not seem a healthy condition, for it removes incentive to good work from those who make up the major part of the workers in the gas field.

In filling an important position the management of any company should look among his own men and select the one who best can do the work. If it becomes known that there is opportunity for all to advance then there is going to be inculcated a spirit of contentment among the employees that is going to work for the greater good of the enterprise.

But we find that many companies go to others and engage department heads, etc. In many cases the management is quite frank in stating that they could not find a man in their organization capable of filling the position. This is a reflection, not on the employees, but on the executives themselves. It means that they have no right to be filling the important jobs they are holding down for they are incapable of developing men and certainly there is no more important task before us to-day than preparing others to carry on the business in the future.

The next time you have a good job to fill try moving up your men. It will certainly add to the efficiency of your organization and if the man has been properly trained there is no reason why he should not prove satisfactory. But the test will be of the management and not of the individual.

Constancy of Gas

There is not enough stress placed by gas companies on the ever-readiness of their product. Twenty-four hours each day, every day in the year, all that is necessary for any housewife to do is to turn on the gas. The industry does the rest. But the public has come to regard gas and its continuous service as in the ordinary course of events.

This is the time to halt this and the way to do it is to let the public know of your troubles. Tell your consumers not what gas is, nor how it is made, but of the work that you and your staff daily must go through in order that gas may be on hand when they want it.

It is a far cry from a bustling gas works to a politician's office, where the usual experience is that the official is out, no matter what time of the day. Yet it is these selfsame politicians and officeholders who are constantly menacing the welfare of the community by attacking the gas company.

The one way to offset this is by pointing out to the public the record of your gas company. Probably when you begin compiling the figures you will be surprised yourself.

Conditions in England

The article regarding conditions in Great Britain gas plants which is published in this issue is particularly timely, for it shows that conditions in this industry are similar the world over. It would seem, however, that gas plants abroad have even more to contend with than we have in many respects, although the question of rates seems to be the smallest part of their worries.

One of the interesting and significant points that are brought out in the article is the fact that there is a likelihood of a further reduction in the B.t.u. standard. This follows an almost national reduction in England, and shows that in this respect at least they are far advanced over the United States.

The article is well worth reading from the standpoint of America, for it adds to the information that we have of conditions abroad and it points the way for action in this country.

Denver's Gas Pressure System

(*Continued from page* 246.)

other and better location in relation to the load center. We have followed the third plan, in substance, by the installation of a district holder at the logical point to supply the affected pressure area, removing the necessity for new mains of any kind. The action of the district holder would improve the load factor on the entire system, the mains would again be adequate in size since the load would be distributed between the plant and the district holder and pressures would be reduced on the entire system, though adequate pressure would be maintained at the extremities or low points. Other district holders would be added in various load centers as the city grew or as the gas demand indicated their necessity. While new mains of ample size would be required as time goes on, these expenditures would be reduced to the absolute minimum, since it would not be necessary each time the distribution system experienced an overload on the peak period to go back to the plant and increase main sizes from there toward the extremities as would be the case if district holders were not employed.

The usual demand load curve on a gas system will show certain district peaks and depressions covering the periods of the day when the demand is greater or less. The ordinary domestic load has three periods, corresponding to the meal hours, when the demand is much heavier than at other times during

the day. One of these periods, which usually corresponds to the dinner load, is the peak hour of the day and during this peak hour there is usually a period of from five to fifteen minutes duration when gas is demanded at a higher rate than at any other time during the day. This is the supreme peak and for which the distribution system must be designed, regardless of the short period of time involved, as proper gas service means adequate pressure to the customers every minute of the day. A typical load curve will show that 75 per cent of the daily gas demand occurs in one-half of the daily period, which usually extends from 7 A. M. to 7 P. M. The peak hour demands 10 per cent of the daily load while the supreme peak period of short duration demands a rate of flow corresponding to 15 per cent of the total daily load. Therefore the rate of demand is 3.6 times greater during the supreme peak period than it would be if the demand were equal over the entire day. It follows that the better load factor obtained on the plant and distribution system through the elimination of peaks the greater the total load may be for given sizes of mains in the distribution system. Actually 3.6 times more gas may be handled through the same mains if a 100 per cent load factor is obtained than if the usual peak prevails upon the plant. While the demand upon the entire gas system is unchanged by the use of district holders, these holders absorb the peaks and valleys by discharge and exhaustion so that the load factor is nearly ideal and thereby relieves the plant and distribution system from the effects of the irregular demands that would otherwise be experienced.

If the rate of flow during the hourly period equals the maximum capacity of the mains leaving the plant at the maximum allowable pressure, then by the installation of district holders the expenditure for enlarging mains is deferred until the average load upon the plant builds up to the present peak period load. If the load on the plant is as that previously outlined the daily output will have increased 3.6 times before enlargement of the mains supplying district holders will be required. The period of time in which the mains will remain of adequate size will depend upon the rate of increased gas load and can be predetermined for any rate of increase. If the yearly rate of increase is 10 per cent over the previous year, and continues at this rate from year to year, enlargement of mains can be deferred thirteen and one-half years for any original size of main and output. It will be found by calculation that the interest on the deferred expenditure for new mains will buy the district holders required and pay the cost of operation for the thirteen and a half years until enlargement of the mains will be required due to the increased average load. It is understood that the district holders take the place of an equivalent amount of storage capacity that would be required in plant holders if district holders were not employed.

The Saving Effected

We have touched but lightly so far upon the possibilities of high pressure distribution which is generally carried out by installation of a separate system of high pressure mains carried to the points in the distribution system where reinforcement of pressures is necessary and there feeding into the low pressure system through district governors. Such a system usually belts the entire city and is installed at an expense enormously greater than that required for the number of district holders, using our system, which would effect the same condition of service. Such mains are naturally a duplication of low pressure mains, thereby adding to the mileage of mains in service. In our own case we have planned such a system comparing it against the one adopted and found the advantage to lie with the latter system.

Since our system involves the use of varying pressures upon the distribution system the use of service governors is required adjacent to the larger feeder mains. In some cases district main governors are used isolating certain sections of the system and in other cases individual service governors are required. The maximum pressure allowed on any customer's meter is 6 in. water column and the minimum 3½ in.

We have heretofore touched only upon the advantages of a district holders system from a standpoint of distributing facilities. Through their use we obtain a safety factor in operation by having our eggs in separate baskets. Our storage is scattered all over the city instead of being confined to the plant where an accident is more liable to put the city out of gas. In the event that anything happens to our plant holder, or to any one of the district holders, the others pick up the load and service is unimpaired.

At the present time we are operating one plant holder and four district holders. Two of the district holders were installed in the fall of 1920. The plant holder has a capacity of 720,000 cu. ft. and the boosting equipment consists of three units of No. 9½ Roots Style A, H. P steam-driven exhausters. They supply gas to the distribution system through a 30-in. main feeding the city proper, a 16-in. main to district holder No. 2, and an 18-in. main feeding the district of North Denver, where no district holder is yet required. District holder No. 2 is located at Twentieth and Blake Streets, one mile distant from the plant and supplies the principal business district of the city. It has a capacity of 250,000 cu. ft. and is supplied from the plant through a 16-in. main discharging into a main of the same size in the distribution system. The boosting equipment consists of two units of Connersville exhausters, electrically driven, having a displacement of 13.5 cu. ft. per revolution. District holder No. 3 is located at East Thirteenth Avenue and Harrison Street four miles distant from the plant and principally supplies the Park Hill and parts of the Capitol Hill district. It has a capacity of 500,000 cu. ft. and is connected to a 12-in. feeder main on East Fourteenth Avenue by a 16-in. main. Boosting equipment consists of one Connersville, 13½ cu. ft. displacement, exhauster electrically driven and one No. 11 Buffalo pressure blower, electrically or gas engine driven. District holder No. 4 is located at West Cedar and South Elati Streets, three miles distant from the plant, and supplies the district of South Denver and parts of West Denver and Country Club districts. It has a capacity of 500,000 cu. ft. and connects with a 16-in. feeder main on Bannock Street. Boosting equipment consists of two units of No. 8 Roots Style "D" high pressure exhausters, electrically driven, district holder No. 5 is located at California and Twenty-fourth Streets two miles distant from the plant. It has a capacity of 500,000 cu. ft. and is connected to the distribution system through a 16-in. main to a junction at Twenty-third and California Streets supplying 16-in., 12-in.

and 10-in. mains feeding to the business, Capitol Hill and East Denver districts. Boosting equipment is identical with holder No. 4.

Prior to the year 1909 a strictly low pressure system had been used in Denver. Certain feeder mains had been enlarged but the rapid growth of the city, especially in the residential district of Park Hill, made necessary an improvement in the supply of gas to that section. This district was supplied from a 16-in. main at Broadway and Fourteenth Avenue, through about four miles of 10-in. mains, which was also the principal supply for the thickly populated Capitol Hill district. The enlargement of this main was evidently necessary unless other means of improving conditions could be worked out. At this time the city was being supplied from the works holder and the Blake Street holder which had originally been in close proximity to the old gas plant at Nineteenth and Delgany Streets, but since the removal of the plant to its present location at Seventh and Wewatta Streets had become the first district holder, although no boosting equipment had been installed. After careful consideration of a number of distribution schemes the one now in use was adopted and district holder No. 3 was erected, boosting equipment installed at the gas works and holder No. 2 and pressure conditions entirely rectified.

Locating the District Holders

As time went on and the load increased pressures at the plant increased to the point we considered the maximum for efficient operation in 1920. During this time we had made no expenditures on our distribution system, although the daily load had trebled in volume of from 2,500,000 to 7,000,000 cu. ft. we decided to add two more district holders and these were placed in service in 1920. A very careful study of our load was made and the locations decided upon were in the exact load centers of the distribution system where the greatest use could be made of the holders. In locating these holders the main sizes in relation to the rapidity in which they could be filled and emptied were predominating factors. It was found by calculation that a holder located in the extremity of a system would be of no value except to the immediate district surrounding it, while if located on the larger mains nearer the main junctions of the distribution system it would aid a much larger district and could be made to feed back to the plant if necessary. The locations of the two holders two and three miles respectively from the plant and on opposite sides thereof have proven in their short period of operation that everything we had expected have been attained. Pressures at the plant have been reduced to one-fourth what they were and the amount of lost and unaccounted for gas has been cut in two. Almost a perfect load factor is being obtained and our distribution facilities are again adequate for a number of years to come. We have found that the load can be balanced between the various holders to a remarkable degree and this can be accomplished with a surprisingly small change in pressure at any of the stations.

The use of telemetric gages was added to our distribution facilities about five years ago and these eliminated guesswork in arranging pressure schedules. Indicators have been installed at the district holders as well as at the plant so that pressure conditions at the extremities of the system are known to the operators at all times and station pressures regulated accordingly. The plant operator acts in a measure as a load despatcher and keeps in touch with the district holder operators at frequent and regular intervals. It is his privilege and duty to shift the load on the various stations to the best advantage.

In conclusion we will briefly touch upon the sizes of district holders best adapted for general use. It is evident that a great number of small holders more nearly approach ideal conditions than a small number of large holders, but their operating cost renders them impractical. Sizes must therefore be used that are large enough to supply the demand put upon them but no larger than this demand requires since the space unused is of no value and therefore wasteful investment. We have decided upon the half million cubic foot holder as best meeting our local requirements and this size is that used in working out our plans of expansion. In other cities, however, other sizes may work to better advantage. Holders are large or small only in comparison; therefore the size of the city and gas output must regulate the size of district holders required. Our adopted size seems small enough to us for an approach to ideal conditions, yet it would be entirely too large for a great many other cities.

Accident Prevention in Gas Industry

(*Continued from page* 251.)

organization and that unsafe physical conditions are corrected by safeguards and other means of protecting his men in the performance of their duties.

Lack of Supervision Cause of Accidents

Lack of proper supervision enters into a majority of all recorded accidents and is the main reason why the foreman is referred to as the "key man" in safety work. It is only through him that the right influence can be brought to bear on the bulk of the organization. I have in mind one safety organization in a large gas company that has been functioning for about eighteen months. This organization consists of a central safety committee made up of executives and heads of departments, an executive committee and intermediate committees, consisting of superintendents and plant foremen. Meetings of these intermediate committes are held monthly at the plants and for the most part employees are reached and influenced by these committees and the results have proved beyond a doubt that proper supervision is one of the essentials of successful safety work. A large reduction of accidents since starting the safety work on this property is the result of this method.

I was recently called upon to inspect a gas plant in one of the Northern States and I was impressed with the orderly and neat condition in which I found the plant. A gas plant at the best is no place for those who are fastidious on cleanliness, but this plant was an exception and was in a class by itself. I complimented the plant foreman on the excellent housekeeping conditions and asked him if he was having any accidents. His answer can be considered the keynote of safety. He said: "I believe in safety and I see that my men also believe in it." When the time arrives that all men feel as this foreman does about safety, then I believe our work will be in an ideal condition. To reach that goal, however,

many obstacles have yet to be overcome. A firm belief in safety work must be implanted in the minds of men a belief based on results obtained, a belief strengthened by the sincerity of those individuals that are engaged in the work. Only then will our purpose be accomplished.

To summarize, accident prevention work must be considered of equal importance to other activities in the business. The officials, superintendents and foremen must be taught to realize their responsibility for the safety of the men under them, a responsibility that does not cease when efficient operation and proper service are maintained, but also embraces a watchful supervision that will assure the observance of rules and the elimination of unsafe methods. It is their duty to provide such safeguards and other protective devices as may be required and to see that they are maintained in good condition and properly used. The employees should first of all be loyal to their superior and to their company and their principal duty should be to co-operate in every way with those individuals with whom they come in contact in their work.

Only by such methods can successful results in accident prevention be accomplished.

Rapid Deterioration of Water in Tar Explosions

(*Continued from page* 252.)

lighter in color than the tar solution below, and to have a sharp lower boundary. If now a glass rod be inserted in the bottle, practically the whole of this material can be drawn out, sticking to the rod. If it is then rubbed on glass, the water in it will separate, and it is then seen that the bulk of the rest, which consists mainly of carbon, is very small. In other words, the whole part of the liquid which is above the sharp line between the tar solution and the sludge may be considered, without any great error, as being all water. If greater accuracy is desired a longer centrifuging will reduce this sludge still further, and even cause it to be eliminated. Warming the solution before centrifuging helps in the separation.

Seen from above, the surface water-carbon bisulphide and water-carbon tetrachloride are convex. In the centrifuge, however, such surfaces are flattened out, so that the line of demarcation on the neck of the cream bottle represents a flat surface of contact, since the stain will remain even when the meniscus changes shape—if the sludge permits a change of shape. It is, therefore, necessary to allow for this in reading the upper surface—a point intermediate between the upper and lower edges of the meniscus being chosen.

The method, as we carry it out, is as follows: Weigh out 10 grams of tar emulsion into a cream bottle. Fill the bottle nearly to the neck with carbon tetrachloride and mix well by shaking carefully. Fill the bottle to the top graduation with carbon tetrachloride and centrifuge. Two or three minutes at 2,000 r.p.m. are ample for most determinations. Read the number of divisions occupied by the water, counting all the sludge as water and taking as the upper mark a point halfway between the top and bottom of the upper meniscus. Twice the number of divisions equals the per cent of water by weight. If per cent by volume is desired, take 10 c.c. of emulsion in place of 10 grams.

The cream bottles can be obtained with necks of varying diameters. We made use of 30, 35 and 50 division bottles, according to the amount of water in the tar. There are also obtainable 10 division bottles, called milk bottles. The fewer the number of divisions the smaller the neck, so that these bottles are more accurate for smaller amounts of water but the slender neck makes it somewhat difficult to fill them.

In some experiments made with a synthetic tar emulsion prepared from anyhydrous tar, carbon and water it was found that the results seemed, as might be expected, slightly high, but the differences were within the necessary errors in reading the volume of water. The method, for large amounts of water (say, 75 per cent) is accurate within the limit of 1 per cent. It is more accurate the smaller the amount of water present in the emulsion.

It is very evident that this method is more rapid than the distillation method. It is easy to make two determinations by this method in less time than it would take to set up he apparatus for a determination by distillation.

Eight determinations can be made and the apparatus cleaned in half an hour.

Method II

This method depends on the fact that carbon black has a very strong absorbing power for the oils of which tars are composed. Carbon black is a light, fluffy powder, somewhat similar to lamp black, made by the imperfect combustion of natural gas. When this is added to oils or tar in proportions depending on the character of the oil, it forms a pasty mass, of the consistency of a heavy putty. The amount required to do this with tars is about one-fifth the weight of the tar. The tendency to do this is so strong that when carbon black is added to a tar emulsion it will draw the tar, as it were, away from its network around the water, leaving the water drops free to unite and be poured off.

The method of making a determination is very simple. We found a mortar a convenient receptacle in which to perform the operation. Weigh out into a mortar 100 grams of the emulsion. Add successive small portions of carbon black, meanwhile mixing well with a spatula until the residue becomes a thick paste, similar to thick putty, pouring off into a graduate the water that separates from time to time. Knead the paste well with a spatula or pestle until no more water separates. The cubic centimeters of water separating represent directly the per cent of water in the original emulsion.

It is evident that the accuracy of this method is greater the larger the amount of water present, since the chief source of error is the water retained in the paste. We found that we could represent this loss very well by adding to the water found 2 per cent of the percentage of anhydrous tar. With this correction, the results obtained were very close to the true value. Not enough work was done to determine whether this factor is suitable for all varieties of tar emulsions. Probably each analyst can determine this factor for his particular use. It will be seen that for emulsions of high water content the correction is not of much importance.

Discussion of the Methods

Applicability—The distillation method works easily and quickly for tars of low water content, but for tars

of high water content it becomes tedious and difficult. Method I, while suitable for all percentages of water, is most satisfactory for emulsions with a low water content. Method II, on the contrary, is best suited for emulsions of high water content.

Cost of Materials—This is small for all three methods, and need not be considered, in comparison with other factors.

Apparatus Needed—In this respect Method II is most favorable as its requirements for apparatus and materials are few. Method I, on the other hand, requires a centrifuge and special glassware. The distillation method occupies an intermediate position.

Time—In regard to time, the two methods here proposed as far in the lead, compared to the distillation method.

Accuracy—Here a carefully conducted distillation should have the advantage. Which of the other two methods is the better depends on the water content of the tar.

In conclusion, it seems probable that for the sale of tar and tar emulsion the methods here proposed can hardly compete with the distillation method, especially as the latter is quite firmly entrenched in contracts. For routine works analyses, however, where the highest accuracy is not required, those methods will, it is thought, be found very useful, as they require but a small fraction of the time that a distillation demands. Especially is this true of Method II. Many laboratories may not find it profitable to invest in a centrifuge, but a can of carbon black costs little and may save time and trouble.

Gas Heating in the Shipyards

The high cost of shipbuilding and the present capital stringency, renders it a matter of prime importance that economies should be practised in every direction possible, provided always that the quality of the work turned out is not impaired. The most laborious and therefore the most expensive operations in the shipyard are to be found in connection with the heating and bending of the frames and plates, and many efforts have been made in the past to reduce expenditure in this direction. Ship designs have been brought forward from time to time in which the number of frames and plates which required forming was reduced to a minimum, but it is recognized that these designs while leading to cheap and rapid building are not highly efficient from the point of view of propulsion, and therefore the more usual ship form is the one which still finds greatest favor among shipowners at the present day. Attempts must, therefore, be made to reduce the cost of heating and bending the frames and plates, and since the shapes must necessarily differ more or less from each other, the employment of machinery becomes a matter of great difficulty. It is obvious, therefore, that economy must be sought in the improvement of the methods of heating.

Study of Recent Developments

A study of the developments which have been made in shipyard practice during recent years reveals the fact that this is indeed the direction in which methods for the reduction of costs are being devised. Many suggestions have been put forward for the elimination of the old-fashioned coal-fired plate or section furnace, and oil, gas, and electricity have each been put forward as more efficient heating agents than coal. Of these substitutes, judging from results actually achieved, it would appear as though gas is the one which can be most satisfactorily employed in the shipyard.

In one shipbuilding yard the rivets are manufactured from rods heated in gas-fired furnaces, plates and angles are heated in gas-fired furnaces, all pipe bending, forging and drying off foundry cores is done by gas, and it has been found that a great saving has resulted from this universal application of gas, and it is also found that there is an improvement in both the quality and the quantity of the work done.

It is of interest to note that the gas is not consumed just as it issues from the mains, but is first of all mixed with air in the ratio of about one of gas to one and a half of air, both measured at atmospheric pressure after which the mixture is compressed to a pressure of about four pounds per square inch before being sent to the distributing system in the shipyard. In the burners of the various types of heaters, the Bunsen principle is employed; that is, the compressed mixture in its passage through the burner draws in air, and it is claimed that by this means a far more complete combustion of the gas is obtained and a higher flame temperatuer is produced.

It will be seen, therefore, that the use of a compressed mixture of gas and air in all types of furnaces used in the shipyard is capable of effecting considerable economies as compared with the use of coal or coke. The question of initial capital outlay is, of course, one that must be carefully considered but of the ultimate saving there can be no question and the problem is one worthy of investigation.

Fire in Gas Plant

Brockton, Mass.—Flaming water gas tar, blinding smoke and unbearable heat gave the firemen the worst battle of the year in the retort rooms on the second and third floors of the works of the Brockton Gas Light Company, on Grove Street, at 5.30 A. M. Monday, March 14.

Water had no effect on the burning tar. Chemical lines, a generous use of bicarbonate of soda and sand had to suffice.

Within a few minutes from the time of the alarm from box 152 Chief William F. Daley had all the apparatus with chemical lines on hand. The extreme heat kept the firemen away from fighting distance. They had to wait for the tar to burn itself out.

Part of the crew of fire fighters finally got within reach. Others stayed below to quench any blaze which might start on the lower floors, caused by dropping of the burning tar.

The fire is believed to have started from overflow of tar in the retort rooms catching fire from the heaters below. The blaze spread rapidly in the huge vats of tar. The fire was discovered by the night watchman, Thomas Mulcahy, of 20 East Union Street, who was turning in his duty call at the top of the tower. He was nearly overcome by flames and smoke. With great difficulty he made his way through the smoke-filled passageway to the fire signal box on the ground floor. He then ran to the street and rang the box alarm. O. W. Adams, superintendent of the plant, and George H. Priest, general manager, were notified and were on the scene early.

Public Utilities Securities Market Report

Prices of Representative Gas Bonds

(Quotations furnished by The National City Company)

Company	Issue	Maturity	—Market— Mar. 17, 1921 Bid	Asked
American Lt. & Trac. Co.	Five Year 6s	May 1, 1925	90¼	91½
Brooklyn Union Gas Co.	First Consol. 5s	May 1, 1945	76½	77¼
Columbia Gas & Elec. Co.	First 5s	Jan. 1, 1927	84	85½
Consol. Gas, Elec. Lt. & Pr. Co. of Baltimore	First Ref. 7½s	Dec. 1, 1945	99¼	100¼
Consol. Gas, Elec. Lt. & Pr. Co.	General 4½s	Feb. 14, 1935	75	76
Consol. Gas Co. of New York	Sec. Conv. 7s	Feb. 1, 1925	99¼	99½
Consol. Gas Co. of New York	One Year Sec. 8s	Dec. 1, 1921	99½	99¾
New Amsterdam Gas Co.	First Consol. 5s	Jan. 1, 1948	57	60
Denver Gas & Elec. Co.	Gen. (now 1st) 5s	May 1, 1949	80	81½
Detroit City Gas Co.	Gold 5s	Jan. 1, 1923	90½	92
Equitable Illum. Gas Lt. Co. of Philadelphia	First 5s	Jan. 1, 1928	93½	95
Hudson County Gas Co.	First 5s	Nov. 1, 1949	74	77
Laclede Gas Light Co.	Ref. & Ext. 5s	Apr. 1, 1934	73	73½
Louisville Gas & Elec. Co.	First & Ref. 7s	June 1, 1923	94	95½
Michigan Light Co.	First & Ref. 5s	Mar. 1, 1946	70	75
Milwaukee Gas Light Co.	First 4s	May 1, 1927	82	83½
Pacific Gas & Elec. Co.	Gen. & Ref. 5s	Jan. 1, 1942	77¼	78
Pacific Gas & Elec. Co.	Col. Tr. Conv. 7s	May 1, 1925	96	97
Pacific Gas & Elec. Co.	First & Ref. 7s	Dec. 1, 1940	98	99
Cal. Gas & Elec. Corp.	Unif. & Ref. 5s	Nov. 1, 1937	84¼	85
Peoples' Gas Lt. & Coke Co.	Refunding 5s	Sept. 1, 1947	70	70½
Chicago Gas Lt. & Coke Co.	First 5s	July 1, 1937	72	74
Portland Gas & Coke Co.	First & Ref. 5s	Jan. 1, 1940	75	77
Seattle Lighting Co.	Refunding 5s	Oct. 1, 1949	63	66½
Southern California Gas Co.	First 6s	Nov. 1, 1950	84	86
United Gas Improvement Co.	Two Year 8s	Feb. 1, 1923	99¼	99¾
Utica Gas & Electric Co.	Ref. & Ext. 5s	July 1, 1957	75½	78
Washington Gas Light Co.	General 5s	Nov. 1, 1960	77½	78½
Western States Gas & Elec. Co. of California	First & Ref. 5s	June 1, 1941	73	76

Annual Report of Houston Gas Company

Houston, Texas.—The Houston Gas & Fuel Company has filed its annual report for the year ending Dec. 31, 1920, as required by section 6 of the city charter under the caption of "Reports of Owners of Franchises." The report shows the present running condition of the company. The authorized capital stock of the company was fixed at $2,050,000, which is completely covered by outstanding stock. The bonded indebtedness of the company was fixed at $1,670,000, of which 7 per cent bonds due March 1, 1923, amount to $900,000 and 5 per cent bonds, due Sept. 1, 1932, amount to $770,000. The indebtedness of any and all kinds of the company, floating indebtedness, including bills payable of every nature, is fixed at $365,885.23.

The assets of the company are fixed at $1,925,697.80, of which $1,725,000 is for lands, buildings and equipment, $65,621 for bills receivable and $135,076.80 cash on hand.

The operating expense of the company was fixed at $891,529.29. The gross earnings were estimated to be $959,361.82, and the net earnings were estimated to be $67,832.53.

In detail, the operating expense of the company shows as follows:

Amount paid in salaries, $77,682.16; labor, $83,030.82; fixed charges, including interest, $140,474.41; taxes, $74,380.89; insurance, $4,478.89; amount paid in full, $352,821.32; amount paid for extension, $124,702.03; reserve for renewals, replacements, $51,758.66, and maintenance, $37,859.92. Amounts paid for claims for suits for damages were estimated at $435.55, and miscellaneous expenses were estimated at $68,606.67.

The gross earnings of the company were placed on the report at $959,361.82, and other revenues at $63,197.16. The revenue for gas was $896,182.66. The price charged the public for this gas was stated to be $1.19 gross, discount of 10 cents per 1,000 cu. ft., making the net cost $1.09.

Dividends

H. M. Byllesby & Co. announce the declaration of the following regular quarterly dividends by the board of directors of the several companies involved:

Standard Gas & Electric Company, preferred, 2 per cent; payable March 15 to stockholders of record Feb. 28.

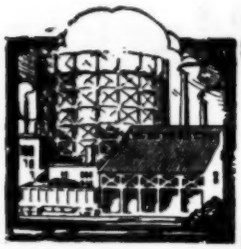
Oklahoma Gas & Electric Company, preferred, 1¾ per cent; payable March 15 to stockholders of record Feb. 28.

The Arkansas Valley Railway, Light & Power Company, preferred, 1¾ per cent; payable March 15 to stockholders of record Feb. 28.

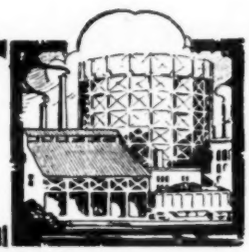
To Rebuild Gas Retorts

Lincoln, Ill.—The Lincoln Water & Light Company has just placed a contract with the Gas Machinery Company of Cleveland, Ohio, for the rebuilding of one set of six gas retorts, the work to begin immediately.

While these new retorts are not needed at the present time, yet the company thinks it advisable to have them in reserve, and the placing of this contract is in line with the determination of the new company.



NEWS OF THE GAS INDUSTRY



Illinois Association Holds 17th Annual Meeting

Stirring Addresses Made by Leaders of Public Utilities

Chicago, Ill.—The seventeenth annual meeting of the Illinois Gas Association was held this week in Chicago in conjunction with the Illinois State Electric Association and the Illinois Electric Railways Association. The morning sessions were joint meetings and each association held separate meetings afternoons. At the opening session Tuesday W. M. Willett, president, Illinois Gas Association, made an address which contained many suggestions of value to all branches of the gas industry.

John F. Gilchrist, vice-president, Commonwealth Edison Company, talked on the financing of utility companies. He stated that while a short time ago such securities were not thought well of by either bankers or investors that now it is becoming recognized that utility securities are only second to Government securities in point of stability. Mr. Gilchrist advocated the selling of securities through selling organizations made up of company employees. He cited several instances where securities of electric companies amounting to from one to ten million dollars were sold in this way. The average number of shares taken by each buyer was five, but this wide distribution of the stock in the community resulted in an increased friendly interest in the company, and a disposition to see that the company was fairly dealt with by the regulatory bodies. Also the contact of the company employee with the customer creates a good-will that is invaluable, he stated.

On Wednesday morning Charles A. Monroe, president of the American Gas Association, explained what the association was doing for the benefit of all branches of the industry. Several important papers were read in the gas section meetings, which will be published in the AMERICAN GAS JOURNAL.

The banquet was held Wednesday evening. Over 1,000 attended.

New officers elected are H. H. Clark, Chicago, president; R. S. Wallace, Peoria, vice-president; C. V. Prather, Springfield, secretary-treasurer.

Wynne with Doherty Over 10 Years

A. V. Wynne, who recently succeeded W. W. Lowe as general manager of the Bartlesville Gas & Electric Company, Bartlesville, Okla., on Mr. Lowe's transfer to the New York office, is a Doherty man of more than ten years' standing. He has been with the Doherty organization in various properties since 1910, when he entered the Denver cadet school as a junior engineer.

Mr. Wynne is a graduate electrical engineer, from the University of Pittsburgh. He graduated from the university in 1910, and entered the Doherty organization that same year. After a year and a half as cadet, he was transferred to Warren, Ohio, as engineer for the Trumbull Public Service Company, which had just been purchased by Henry L. Doherty & Co. A year and a half after that Mr. Wynne was transferred to the Massillon Gas & Electric Company, Massillon, Ohio, as general superintendent. During the time he was in Massillon the powerhouse was completely rebuilt and the generating capacity tripled.

In 1915 Mr. Wynne was appointed general superintendent of the Richland Public Service Company, Mansfield, Ohio. As the Doherty Company did not own or operate an electric light company there it was necessary to build an entire new power house, transmission line, substation and distribution system.

Two years later he was transferred to Fremont, Neb., as vice-president and general manager of the Fremont Gas & Electric Light Company. In 1919 Mr. Wynne was made general superintendent of the St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo. While he was there the power plant was rebuilt and the capacity doubled. He came to Bartlesville in January of this year.

Chew Made Manager

R. E. Chew has been appointed general manager of the Union Gas & Electric Company, Bloomington, Ill., to succeed Ray Stretch. Mr. Stretch will turn over his position the latter part of March and shortly after will enter the automobile business. Alan Lockwood will be the temporary manager until Mr. Chew can complete a matter now pending for the parent company before the court of industrial relations in Kansas.

Providence Company Report

Providence, R. I.—More gas was manufactured by the Providence Gas Company during 1920 than ever before in its history, and the increase over 1919, which amounted to 392,045,000 cu. ft., or 13.9 per cent, was the largest increase in volume of any and the largest percentage of increase in any year except 1902. The 1920 "sendout" was 2,485,972,000 cu. ft.

The seventy-fourth annual report made by the company's directors to the stockholders, at their annual meeting stated that this increase in "sendout" was an abnormal one, caused by extraordinary conditions, including the scarcity and high price of anthracite coal, "which probably will not prevail in 1921." A smaller "sendout" is anticipated for the present year

Temple Gas Company Must Meet Franchise

Temple, Texas.—Attorneys for the city of Temple and several local citizens made application and were granted a restraining order and mandamus against the Temple Gas Light Company, defendant, of this city. The writs were issued out of the Bell County district court and restrain the gas company from suspending its service in this city as it had given notice to do, and also commands that it comply with the terms of its franchise. The home office of the company is in Detroit, but service was obtained on its local manager. The company was granted a thirty-year franchise in 1912 to operate a gas plant in this city.

The controversy grows out of an attempt on the part of the company to charge higher rates for its product than are permitted by the franchise. The petitioners were required to execute bonds in the sum of $2,000. On two former occasions the city made ineffectual efforts to grant an increase in rates from $1.35 to $1.70 net per 1,000 cu. ft., but the legality of the efforts was questioned by a few citizens and led to the present litigation.

Gas Company Window Exhibit

Portsmouth, N. D.—The Portsmouth Gas Company has an interesting window display, showing the proportionate manner in which each dollar taken in by the concern was spent during the past year. Bright new pennies are used in showing the percentage and the window is very attractive.

Increased Gas Rate Affects Glass Industry

Point Marion, Pa.—The glass making industry in this district is seriously and probably decisively affected as a result of an increased gas rate to local consumers, determined by West Virginia gas supply agencies. One of Point Marion's factories has already completed plans for removal to another district.

Increased gas rates determined for Pennsylvania consumers by West Virginia supply concerns will result in the ultimate abandonment of the glass making enterprise in this district unless there is an immediate adjustment of rates charged consumers.

"West Virginia supply agencies have determined the rate to their Western Pennsylvania customers at 45 cents per thousand cubic feet," said a prominent gas man. "The West Virginia consumption rate has not been changed and is still fixed at 32 cents. At a rate of 45 cents it will not permit glass concerns to longer operate in this district."

So serious is the situation that one plant, the Nilan Glass Company, is already making arrangements to seek forth another field, where gas and supply operating consumption rates will be more in keeping with the profit and operating basis. Officials of the Nilan Company are at present considering the Saxville district, near Punxsutawney, where gas is to be had at a nominal rate far in excess of that calculated by West Virginia agencies.

Local business men are considerably wrought up over the increased rates, it was learned to-day, feeling that, with the withdrawal of glass concerns from Point Marion, the business outlook is bound to be decidedly gloomy. There is but one redeeming feature, in the event of ultimate abandonment and this in the large number of small coal mines being opened in this and the adjacent district.

"Point Marion's prospect of being a fuel center is excellent," said one of the officials. "It is quite improbable, however, that the locality would willingly part with its long established glass making plants."

Bureau of Mines Issues Oil and Gas Operating Regulations

Operating regulations to govern the production of oil and gas have been issued by the United States Bureau of Mines. According to these regulations, it shall be the duty of the oil and gas supervisor and his deputies to visit leased lands where operations for the discovery and production of oil and gas are conducted and to inspect such operations with a view of preventing waste of oil and gas, damage to formations or deposits containing oil, gas, or water, or to coal measures or other mineral deposits, injury to life or property, or economic waste; and to issue instructions which will prevent such waste.

Lessees under these regulations shall provide tanks suitable for containing and accurately measuring the crude oil produced from the wells and shall furnish the supervisor with accurate copies of all tank tables. The quality of oil produced is also determined by the supervisor. The royalties payable under these leases depends both on the amount and quality of the oil produced, ranging from 12½ to 25 per cent for all oil produced of 30 deg. Baume or over and from 12½ to 20 per cent for that of less than 30 deg. Baume.

F. B. Tough, petroleum technologist of the Bureau of Mines, has been made supervisor of oil and gas operations, with headquarters in the Custom House Building at Denver, Col., and will report direct to the Chief Petroleum Technologist in Washington. District engineers and deputy supervisors, together with oil gaugers and clerks, have been placed at Casper, Wyo; Winnett, Mont.; Bakersfield, Cal., and Shreveport, La., reporting to the supervisor at Denver.

Supervision of the leasing act of Feb. 25, 1920, known as "an act to promote the mining of coal, phosphate, oil, oil shale, gas and sodium on the public domain," was placed by the Secretary of the Interior under the immediate direction of the Bureau of Mines. The bureau, up to the present time, has not been able to care adequately for the work, which has expanded until the present oil production from Government lands in California and Wyoming will total 14,000,000 bbl. annually. Prospecting permits for drilling also have been granted in eleven other States and Alaska. Seeing the need of more adequate supervision of this production, Congress, in the closing days of its last session, allotted to the Bureau of Mines $60,000 to properly organize and carry on this work until July 1, 1921.

Governor Edwards Appoints Members of Utility Board

Trenton, N. J.—Governor Edwards has sent to the Senate the names of former Congressman James A. Hamill, of Jersey City, former Civil Service Commissioner Joseph S. Hoff, Princeton, both Democrats, and former Mayor Harry Bacharach, Atlantic City, Republican, to be members of the new State Public Utility Board created under the Wallworth act, recently passed over the Governor's veto. Hamill was named for six years, Hoff for four years and Bacharach for two years.

New System for Automatic Control of Gas Governors

Chicago, Ill.—At Morris as in other towns served by the Public Service Company of Northern Illinois, variation in the demand for gas at different hours creates peak loads which it is the function of district governors to handle. The conventional method consists of controlling the pressure by placing small weights on the auxiliary regulator which is part of the district governor's equipment. The services of a man are required under this plan. An automatic device placed in service in Evanston and in Berwyn and Maywood recently secures this.

The same effect is realized at Morris in a different fashion. In that town the equipment for the purpose includes a small gas holder about one foot in diameter which is installed in a gas-tight case. The case is half full of oil to serve as a seal for the holder. Two three-quarter-inch taps are made in the outlet of the governor, one ahead of the outlet valve and one after the outlet valve. The first tap is connected to the holder case above the holder. The second tap is connected with a riser under the holder. A small cup is placed on the control where the weights are added to vary pressures and another cup is placed on the holder case. A plunger in this cup is directly connected with the holder The two cups are connected with the one-eighth-inch pipe. The cup on the holder case is filled with mercury.

The operation is as follows: The outlet valve is closed sufficiently to cause about two-tenth-inch differential during a pull. This differential acts on the smaller holder causing it to move down. This pulls the plunger down into the mercury, displacing the latter and forcing it through the small connecting pipe into the cup on the control. The mercury serves as additional weight and automatically increases the pressure.

When the pull subsides the differential in pressure at the outlet valve disappears. The holder and plunger return to their normal position and this allows the mercury to return from the control to the cup on the holder, which takes the weight from the control and the pressure returns to normal.

The automatic control device in use in Evanston and at the points named in the above district may be broadly described as an attachment extending from the main arm of the governor actuating the gas valve which controls the pressure. The attachment projects over the small regulator and as the gas valve opens presses down on the regulator. The effect is the same as that secured by the placing of weights. But the attachment's work is more certain because it moves in direct proportion to the opening and closing of the main valve of the governor. As the quantity of gas furnished the district is in direct proportion to the opening of the valve the resulting pressure caused by the action of the attachment varies as to the load.

M. B. Daly Expresses Views on Natural Gas Situation

Cleveland, Ohio.—"The natural gas business in its final analysis is not like any other utility business. It is supplying a commodity which is not replenishable; gas once consumed can never be replaced as gas is not being regenerated."

This is the statement of M. B. Daly, president of the East Ohio Gas Company, which furnishes many cities throughout the State with their natural gas supply.

"The whole enterprise is founded on the same gamble that greets any oil drilling venture," he says. "The saying that 'only the drill will tell' has always applied to gas operations where the product forming the substance of the venture lies 2,500 ft below the surface, and rarely in a stratum that is uniform or spread over a wide area.

"There is one very striking difference between an oil well and a gas well. An oil well when discovered belongs to the man who drills it and he is free to dispose of its product in the best markets. A gas well when drilled belongs to the public and the price is fixed by the buyer without any regard for the cost of the product."

Daly said that in 1910 drilling for new gas in West Virginia, where Ohio gets most of its supply, cost $2,782 per million cubic feet of gas obtained, while in 1920, although much old equipment was used, the new wells completed up to October show a cost of $25,866 per million cubic feet of gas obtained—an increase of over 800 per cent.

In pointing out that the natural gas supply is rapidly becoming depleted, Daly declared the deliveries of the Hope Natural Gas Company, which supplies the East Ohio with most of its gas, dropped from 100 billion cubic feet in 1916 to 79 billion in 1918.

Surplus Reported by Southern Counties Gas

Los Angeles, Cal.—After paying dividends amounting to $120,000 during 1920, the Southern Counties Gas Company had an accumulated surplus at the end of the year of $374,280.02, according to the company's report to the State Railroad Commission, which has just been made public.

The company operates in Santa Ana, Pomona, Santa Barbara, Long Beach and numerous other southern California cities and towns. The report to the State Commission for the year 1920 shows that the company's operating revenue was $2,896,187.26; operating expenses, $2,285,851.25, giving a net operating revenue of $610,336.01.

Miscellaneous non-operating revenue amounted to $18,117. Interest, rent and other deductions totaled $381,171.83. The net corporate income for the year was $246,735.48; surplus at the beginning of the year, $254,380.40; miscellaneous deductions, $6,834.96; dividends, $120,000, and an accumulated surplus of $374,280.02.

Natural Gas Rates Increased

Albany, N. Y.—The Republic Light, Heat & Power Company has been authorized by the Public Service Commission to charge 60 cents a 1,000 cu. ft. with discount of 5 cents a 1,000 for payment of bills within ten days, and establish a minimum charge of $1 a month within the territory formerly served by the Alden-Batavia Natural Gas Company, the Akron Natural Gas Company, and the Attica Natural Gas Company, including Batavia, Attica and other municipalities in Genesee, Erie and Wyoming Counties.

The company asked for authority to charge 75 cents for 1,000 cu. ft., alleging that the present rate for 1,000 cu. ft. is inadequate and insufficient to pay operating expenses, and a reasonable return on the capital invested.

The company has 156 wells in the Corfu, Alden, Pavilion, Akron and Townline fields. There are more than 6,000 natural gas consumers in the territory.

The new rate is to become effective on five days' notice on or before April 1 and to continue in force until April 1, 1922, and thereafter until the commission shall otherwise order.

Consumers Co. Demonstrates Gas Conservation

Ardmore, Okla.—Conservation of natural gas has within the past year become an important consideration in all gas fields of the United States, and the Consumers Light & Power Company is taking an active part in the promoting of the movement. George E. Putnam, an expert on gas conservation, has joined the company's staff, and is conducting a series of demonstrations on the proper use of natural gas so as to get high efficiency without waste.

Mr. Putnam has had wide experience in conservation of natural gas as well as artificial. For six years he was with the Consolidated Gas Company of New York, the largest manufacturers of artificial gas in the world and for the past two years has been with Henry L. Doherty & Co., doing conservation work in Oklahoma and Kansas.

"The first natural gas was introduced a little less than forty years ago in Pennsylvania," said Mr. Putnam this morning, "and since that time many fields deemed inexhaustible have given out practically without notice. The Pennsylvania fields are drained; so are those of New York, Ohio, and Indiana. Many other fields are showing reduced flow. This has resulted in a marked change of attitude toward natural gas.

"Where it was formerly considered proper to promote the greatest possible consumption of gas in the shortest possible time, it is now necessary to conserve gas in every possible way. Only by conservation can the available gas supplies be extended over long periods of years. Otherwise the fields will be exhausted long before their time and great suffering will result.

"Natural gas has about twice the heating value that artificial gas has, yet it sells for 60 cents per thousand where artificial gas under similar conditions now costs from $1.50 to $2.50 per thousand. The great benefit of natural gas is therefore apparent. Continued benefit can only be obtained by preventing waste.

"I have talked with dozens of gas users during the past few days," said Mr. Putnam, "and all who have mentioned the subject state unqualifiedly that they have been wasting gas and are deeply interested in methods of conservation. It is of the utmost importance that gas be saved in every possible way in order that the supply may be prolonged beyond the usual life of natural gas fields, which is only six to ten years."

Glenn Marston, who is well known in the public utility field and who has made a wide study of gas problems, has been in the city for a few days. Mr. Marston states that the question of gas conservation is one of the most important before the people today.

"Terrible waste of gas has marked the operation of every natural gas field in the country," said Mr. Marston, "and as a result many of them are entirely exhausted or giving a very small flow. When it was too late, many companies solved the problem of waste gas by making gas worth saving. Only in this way could the need of conservation be brought home to the gas-consuming public. As long as gas was cheap it did not seem worth saving. Only after the price had been raised to a point compelling conservation did the people take seriously the gas problem.

"Complete statistics on over thirty Kansas municipalities show that the saving of gas increases almost exactly in proportion to the increased rate. The value of the gas remains about the same to the consumer, for the consumer simply uses his gas more efficiently and cuts out waste. It is not necessary to be stingy in the use of gas, but savings can be effected merely by watching for wastes which are not worth bothering about when gas is cheap, but which demand attention when the scarcity of gas forces the price up."

Buys Gas Concern

Bethlehem, Pa.—A deal has been consummated by which Curtis A. Davies, superintendent of police of Bethlehem, became the sole owner of the Montgomery County Gas Company, located at Pennsburg, Pa., for a private consideration. The company property is said to be worth $200,000.

The purchase was made from Tilghman Henry, of Danielsville, who secured control of the gas property about a year ago in a real estate deal.

The gas property was originally owned by the Green Lane Gas, Fuel & Heat Company. This company was later purchased by Oliver Labar, Dr. H. H. Wilford and Attorney J. M. R. Long, of Bangor; C. H. Stead, of Allentown, and Ray Stofflet, of East Greenville, who on Oct. 1 secured a charter of incorporation as the Montgomery County Gas Company. They are said to have paid $200,000 for the property. About a year ago the property was secured by Mr. Henry in a real estate deal.

By this latest deal Mr. Davies becomes the sole owner of the property. The offices are located at Pennsburg, but the company's mains enter five towns in that section, including East Greenville and Sumneytown. There are fifteen miles of mains, an acetylene plant, gas plant, and all modern equipment.

Since the property came into the hands of Mr. Henry the plant has not been operated, but Mr. Davies intends to set men at work next week to put it in operating condition. He has received the assurance from prominent business houses and other interests in that section of their support.

To Arbitrate Lima Rate War

Lima, Ohio.—The city council of Lima has unanimously accepted the principle of arbitration as contained in the recommendation offered by the Chamber of Commerce and several other Lima organizations. The body, however, reserves the right to change any details before the rates are formally accepted.

The basis of agreement is as follows: That the committee to select an engineer shall include two members of the council and one member of each of the civic organizations of Lima, including the Chamber of Commerce. This engineer shall be approved by the council and Lima Natural Gas Company before any contract is signed. Both parties agreed to abide by the findings of the expert, except, however, that the rate shall not exceed 85 cents for the first 2,000 cu. ft., 95 cents for the next 3,000 and $1 or more for the amount over 5,000. A minimum price of 60 cents, 65 cents, 70 cents and $1 is also mentioned.

It is realized that the findings of the expert are not legal, but all parties are quite certain to abide by them. The matter must be settled by next September, when the contract with the city expires.

The contract with Wapakoneta and the same company, although under a different name, expires in September and it is very probable that the same rates adopted in Lima will be offered to Wapakoneta and St. Mary's.

Mobile, Ala.—Jackson, Miss., is to vote on a bond issue for the purchase of municipal ownership of the Public Utilities Company which controls the electric lights, power, street railway and gas plant.

Wisconsin Gas Association Announces Program for Convention

The twentieth annual convention of the Wisconsin Gas Association will be held at the Hotel Pfister, Milwaukee, March 22 and 23. A very interesting program has been prepared.

Meeting will be called to order by President B. Rahn March 22 at 10 A. M. and will proceed in the following order:

Routine Business Address—Oscar H. Fogg, secretary-manager, American Gas Association.

Presentation and Discussion of Papers:

1. Effect of Reduced B.t.u. Standard from Consumers' Standpoint—A. F. Davey, Sheboygan Gas Light Company.
2. Notes on the Manufacture of Water Gas—Geo. E. Wagner, Madison Gas & Electric Company, Madison, Wis.
3. Laying of Twelve-inch Submarine Main (with lantern slides)—William F. Miller, Wisconsin Public Service Company, Green Bay, Wis.
4. The Gas Industry, a Good Customer of the University—Prof. O. L. Kowalke, in charge of department of chemical engineering, University of Wisconsin.
5. Laboratory Investigation of the Use of Hypochlorides as a Gas-Purifying Material—Irwin C. Brenner, incumbent of gas fellowship at University of Wisconsin.

General Business and Election of Officers.

Addresses:

Safety—Chas. B. Scott, N. E. L. A. National Safety Committee.

Public Utility Associations—P. V. Prather, secretary Great Lakes Geographical Division, N. E. L. A.

The Work of the Wisconsin Public Utilities Bureau—Frantz Herwig, director.

P. G. & E. Spends Millions in Improvements

San Francisco, Cal.—For the purpose of taking care of the rapid growth in population and industrial activity on the Alameda County side of San Francisco Bay, the Pacific Gas & Electric Company has just completed installation of a new turbine in its steam electric generating station at First and Grove Streets, Oakland.

The new turbine is of 16,800 h.p. capacity and this, added to the 28,000 h.p. already installed, will bring the total electric generating capacity of the station up to, in round numbers, 45,000 h.p.

The necessity for this additional service to the people of Oakland and vicinity became apparent this time last year when a shortage of electric power in California confronted the power companies and the various industries they served. It was decided to help out the hydro-electric supply from the company's water power plants in the mountains by increasing the capacity of the steam-electric station to a sufficient extent to guarantee adequate service to the entire territory within reach of its local distributing lines, reaching from Richmond to Hayward and taking in the cities of Oakland, Berkeley and Alameda. Included in these plans was the construction of a number of new lines tying in with the high tension power lines from the mountains at the Twenty-third Avenue station, on the outskirts of Oakland.

To Have Gas Supply

Stephenville, Texas.—The City Council has granted a franchise to the Ranger Gas Company to furnish gas to consumers in this city. Work on the line is expected to begin as soon as the company promises to have everything in readiness by Nov. 1.

Gas Rates Lowered

Lowell, Mass.—The Lowell Gas Light Company management announces there will be a reduction of 10 cents per 1,000 cu. ft. in the price of gas, beginning April 1.

January Earnings Standard Subsidiaries

Reports have been received from the following subsidiaries of Standard Gas & Electric Company covering earnings for the twelve months ended Jan. 31, 1921:

	Gross	Net
Arkansas Valley Ry. Lt. & Power Company	$ 1,875,976	$ 604,675
Fort Smith Light & Traction Company	1,075,444	296,296
Louisville Gas & Electric Company	4,588,330	2,116,326
Mountain States Power Company	939,004	295,952
Northern States Power Company	12,046,005	4,532,397
Puget Sound Gas Company	164,851	27,517
San Diego Cons. Gas & Electric Company	2,751,290	874,018
Southwestern General Gas Company	287,506	38,220
Tacoma Gas & Fuel Company	570,102	108,441
Western States Gas & Electric Company	2,258,198	817,484

Church Funds Invested in Gas Stock

Good examples of how highly the preferred stocks of Standard Gas & Electric Company subsidiaries are held locally frequently come to light as a result of the customer ownership movement at the various properties. About the best illustration of this is told in a recent letter from Robert Montgomery, manager of the investment department, Louisville Gas & Electric Company, Louisville, Ky.:

"The treasurer of a little church called on me recently to buy six shares of our preferred stock for the church, explaining that there was a surplus of about $600 in the church treasury and that this fund would gradually be added to until the church, in the course of eight or ten years, accumulated enough money to erect a new building. In the meantime, he wished the money to earn the maximum interest consistent with safety.

"I advised him that it was rather irregular and unusual for a custodian of church funds to invest the money in any sort of stock, but he said his minister and the deacons, as well as himself, all owned some of our preferred stock, and he was thoroughly convinced it was a good investment. Moreover, he said the church would not lose, as he would take full responsibility and personally buy the stock at par, should the church, at any time, wish to realize the cash.

"The more I urged him to place the $600 in the bank at 3 or 4 per cent, the more insistent he became in his demand for the stock. Finally he said if you and the company are that conscientious in handling the business of our customers, you deserve the support of our church and its congregation and from now on we are with you, 'sink or swim,' so the little church is now a shareholder of our company."